Tutorial
H-1000-5319-01-C

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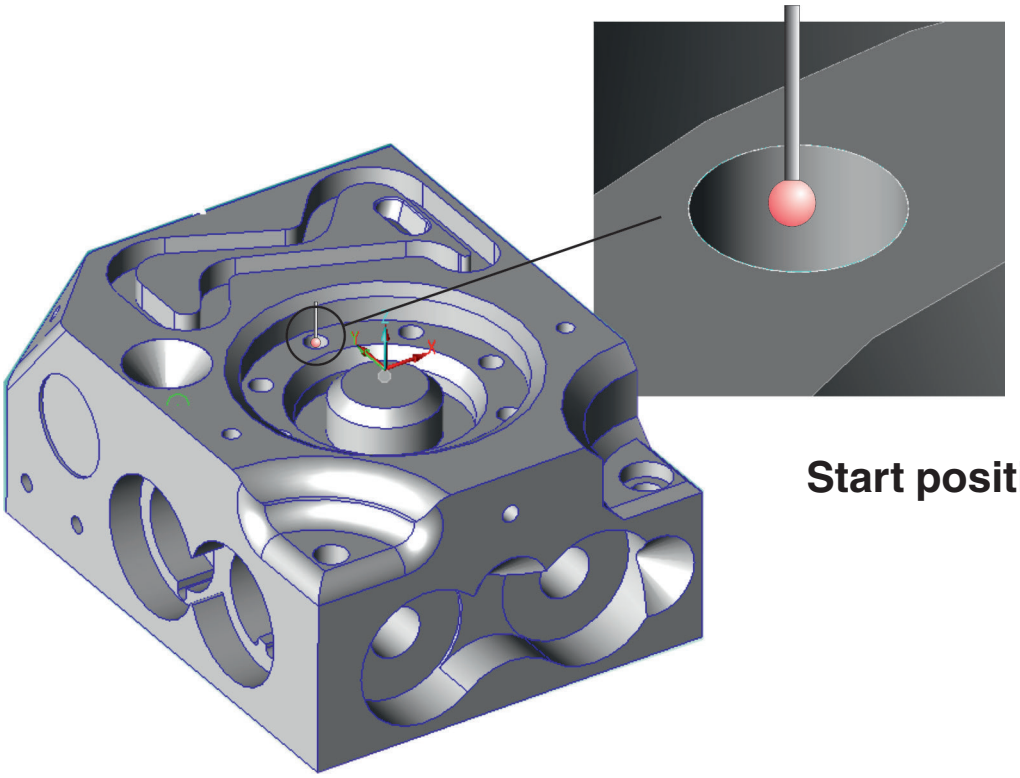
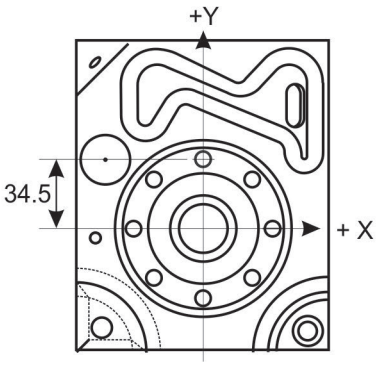
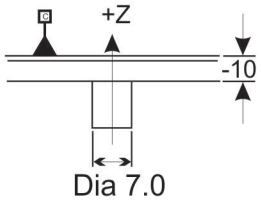
Execute a program from the current probe position (zero point) (non-CAD)



Start position





NOTE: The model is shown only to give a clear representation of the process.

Renishaw part no: H-1000-5319-01-C

Issued: 06 2014

Execute a program from the current probe position (zero point) (non-CAD)

Care of equipment

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Renishaw plc warrants its equipment for a limited period (as set out in our Standard Terms and Conditions of Sale) provided that it is installed exactly as defined in associated Renishaw documentation.

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Contents

1 Execute a program from the current probe position (non-CAD)

1.1 Tutorial pre-requisites

- The student should understand the contents of the ‘Principles of part alignment’ tutorial
- The student should have completed the following tutorials:
  - Part alignment - Plane, line and point
  - Part alignment - Plane and two circles
  - CNC part alignment
  - Cylindrical part alignment

1.2 Tutorial objectives

- Further exposure to CNC part programming from drawing definition
- Introduction to the concept of using a single co-ordinate system in a part program taken from an initial ‘start’ position

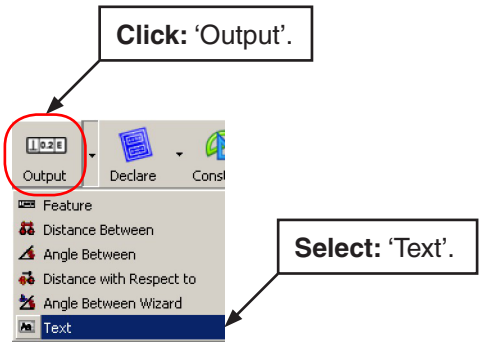
2 Introduction

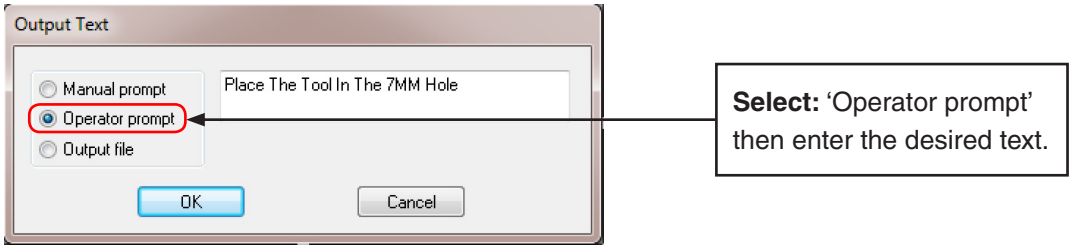
This tutorial will explore an alternative method of part alignment which allows the programmer to create a fully or semi-automated part program. This method reduces the reliance on a CMM operator and will reduce the total run time of the program.

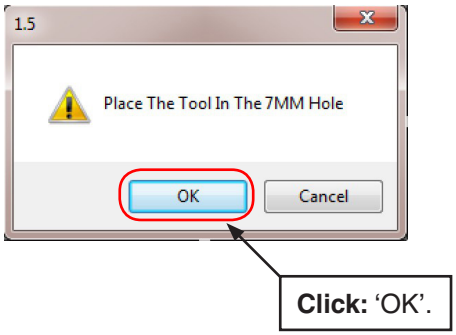
3 Start the CMM from current probe position

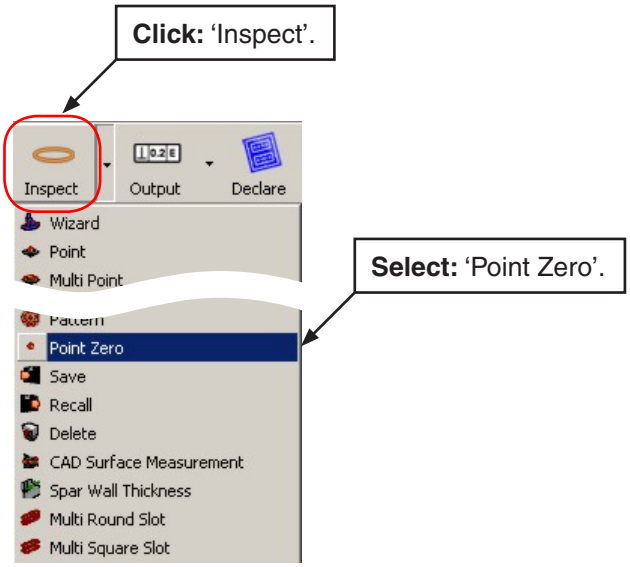
Create a new program.

Now add some simple operator prompts / instructions to ensure the probe can rotate and / or move to the rack and change probe

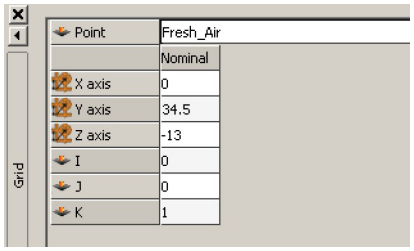


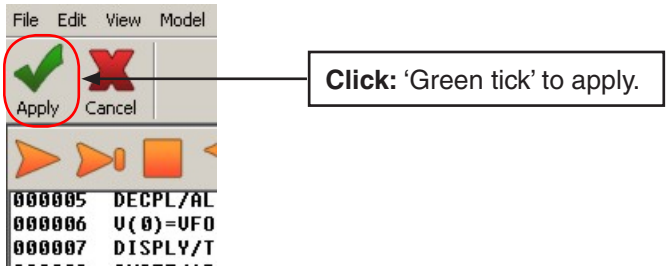






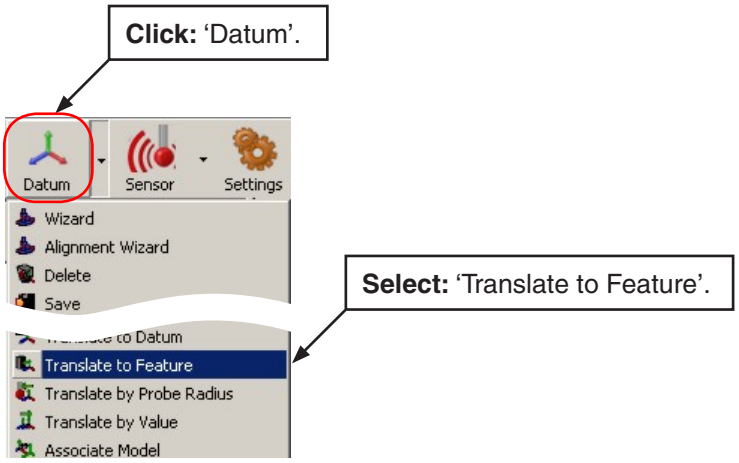
Enter a 'Label' and the point 'Nominal values' for the hole to be measured:



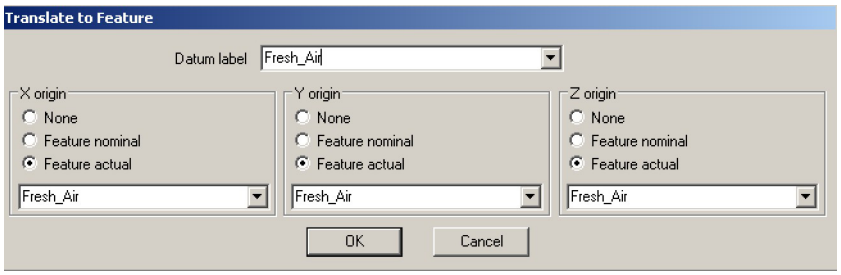


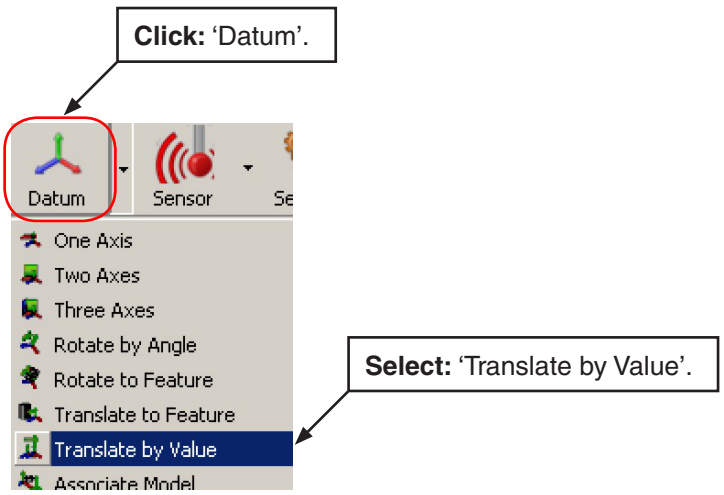
Code produced:

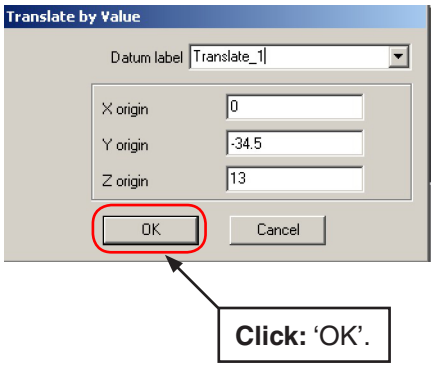
```
F(Fresh_Air)=FEAT/POINT,CART,0,34.5,-13,0,0,1
MEAS/POINT,F(Fresh_Air),0
ENDMES
```



Place origin on the point "Fresh_Air" in X,Y and Z:



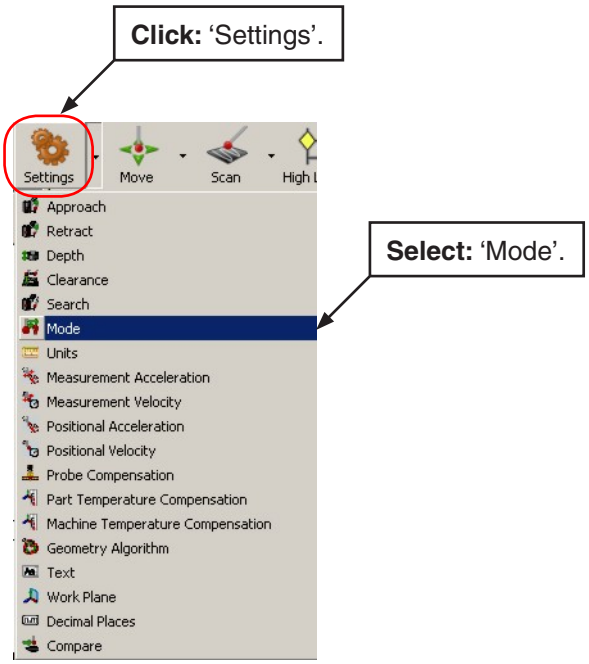


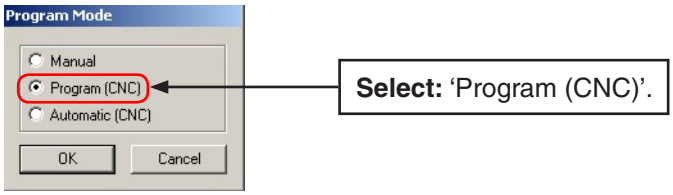


The system now knows, very roughly, where the part is.

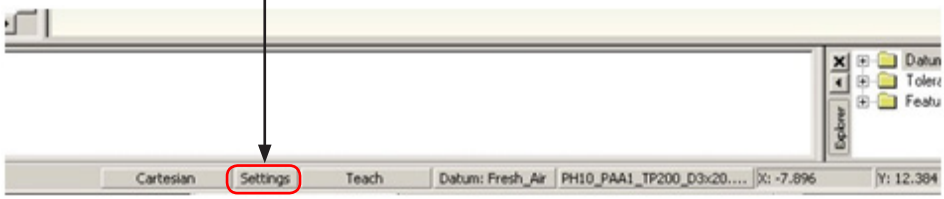
4 Create a temporary basic alignment

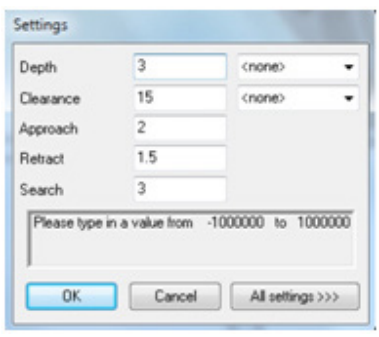
At this point go into CNC mode.





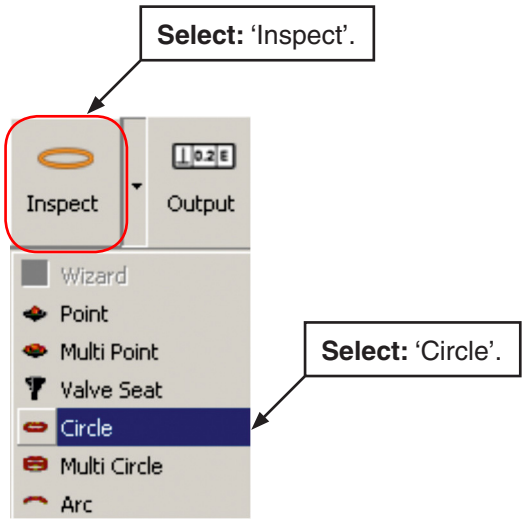
Now change tool ‘Settings’ to allow the system to measure the hole without crashing:

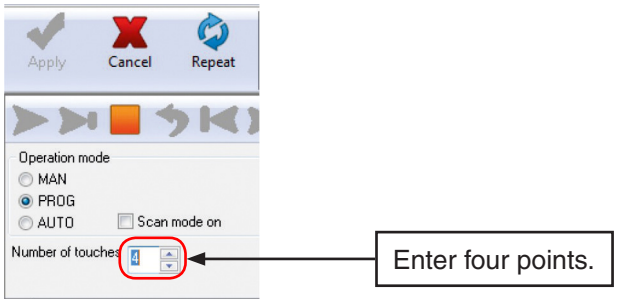




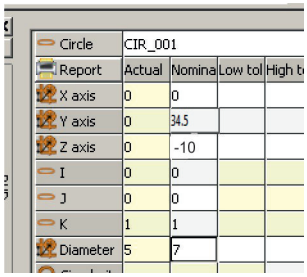
Code produced:

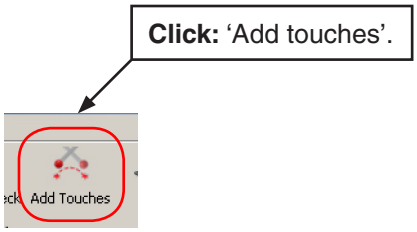
SNSET/DEPTH,3
SNSET/CLRSRF,15
SNSET/APPRCH,2
SNSET/RETRCT,1.5
SNSET/SEARCH,3



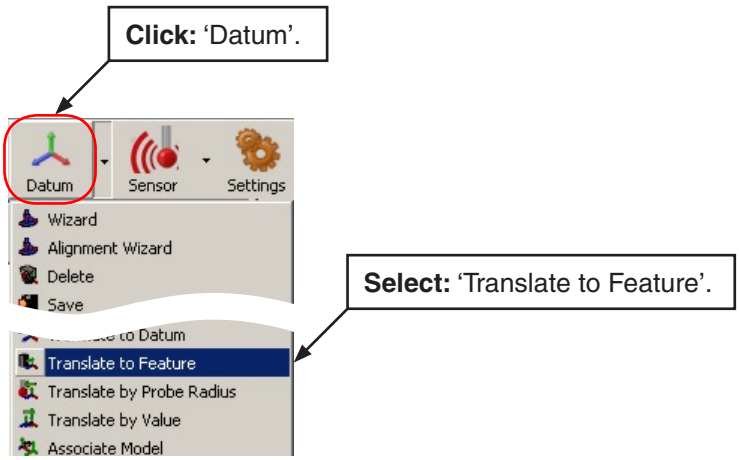


Enter the nominal data for the hole:

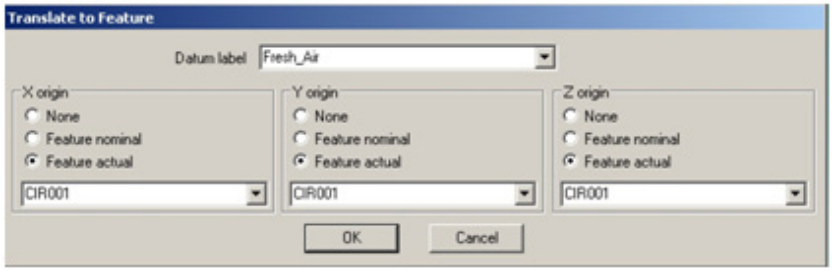




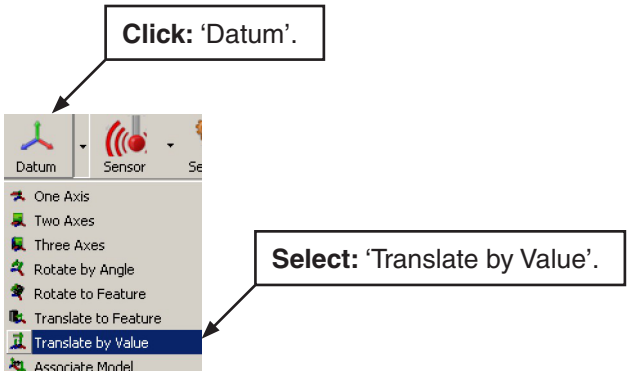
Click 'Apply' then 'OK'. The CMM will now measure the hole.

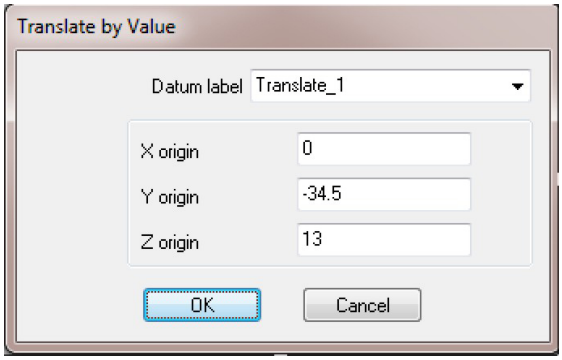


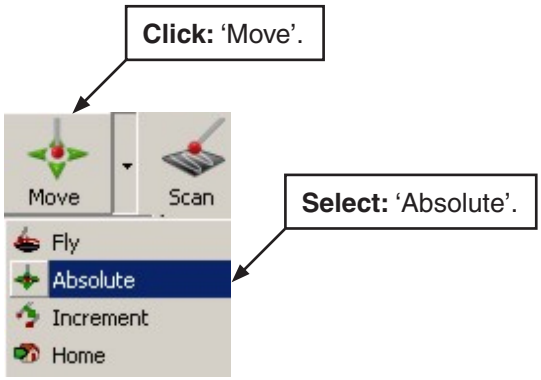
Place origin in hole:



Now translate the origin to the correct drawing position:



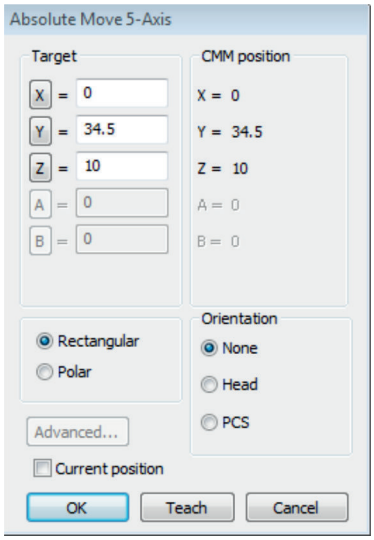




NOTE: Alternatively press the 'Take Point' button on the MCU.

Enter the desired co-ordinates into the 'Target' boxes and then click 'OK'.

Alternatively click the 'Teach' button to learn the current position of the probe.



Code generated in program:

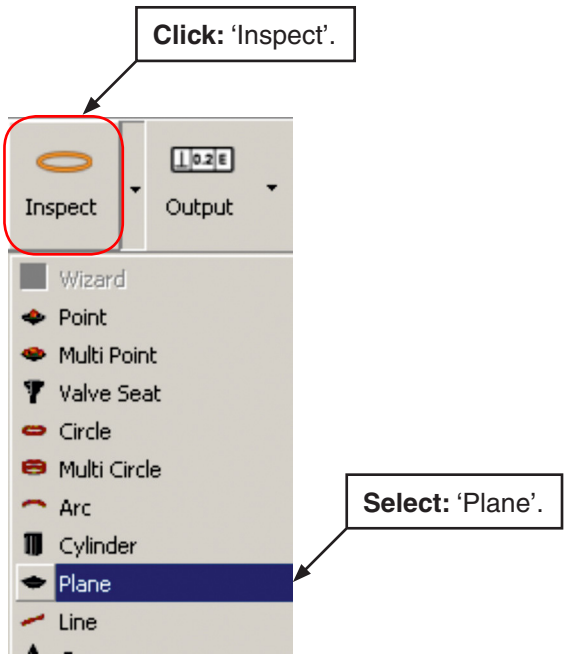
000023 ▶ GOTO/CART,0,34.5,10

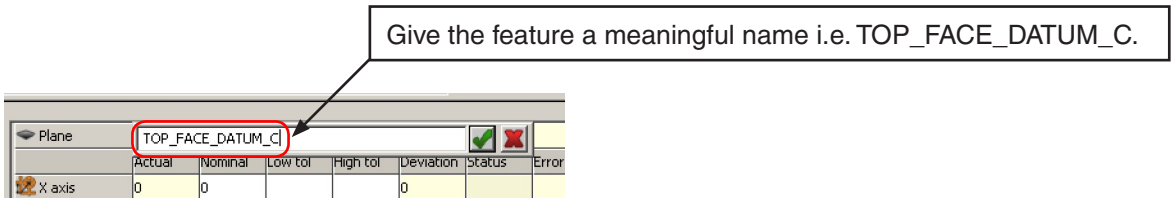
The system now knows **approximately** where the part is located on the CMM, but it has **NO** idea of it's orientation.

5 Create a precise alignment in CNC mode

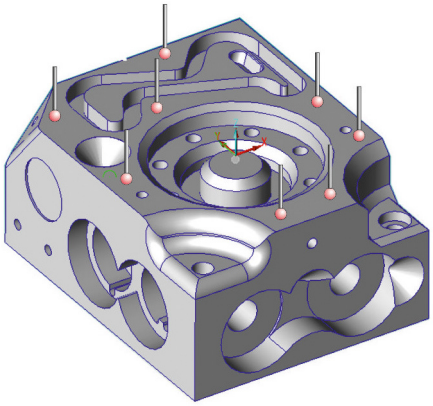
From this point a correct part alignment can be made. The tool 'Approach' and 'Retract' settings should also be increased as the orientation of the part is still unknown.

SNSET/APPRCH,10
SNSET/RETRCT,10

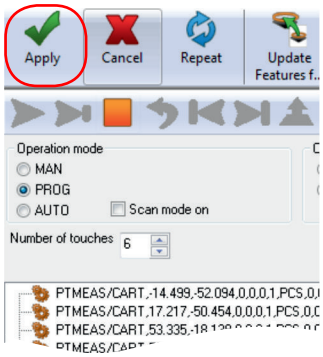




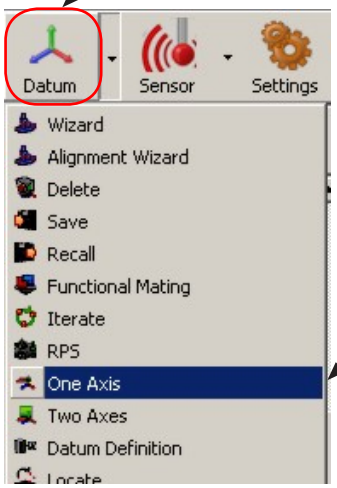
Take eight points on the plane:



Click: ‘Apply’ to complete the measuring cycle.

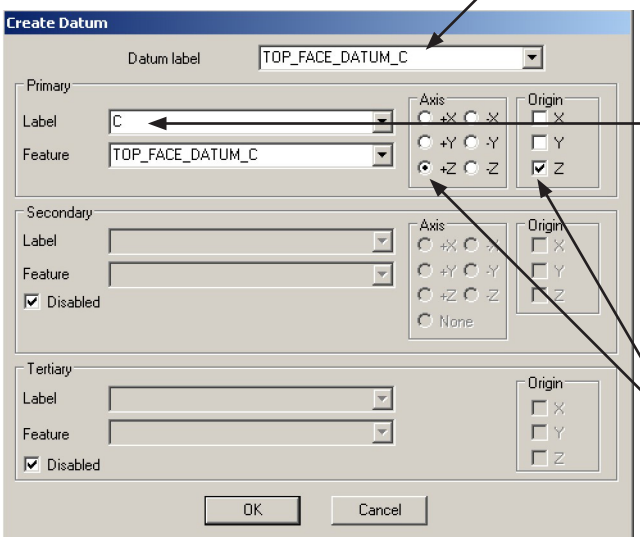


Click: ‘Datum’.



Select: ‘One Axis’.

Give the alignment a meaningful label.

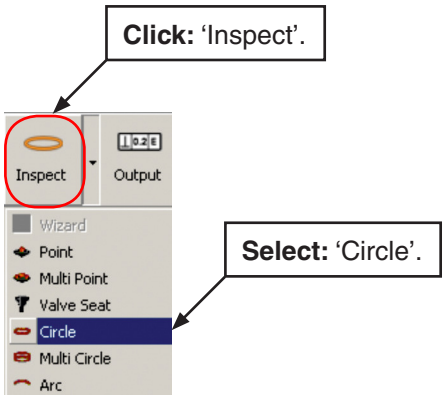


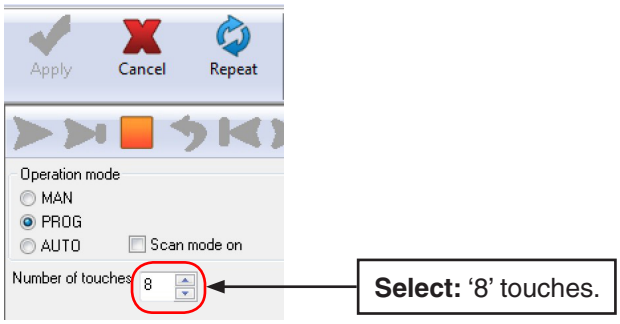
Enter a label for the feature as given on the drawing i.e. overwrite any existing

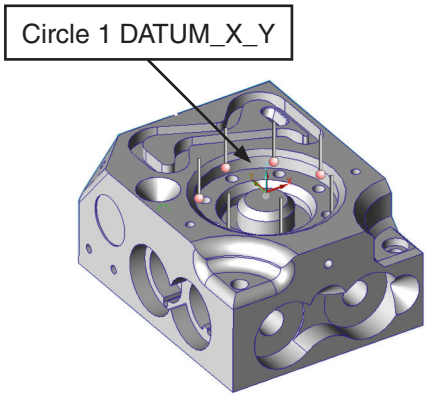
In this case the primary axis is normal to the measured plane and is in Z.

An origin on Z can also be set at this point.

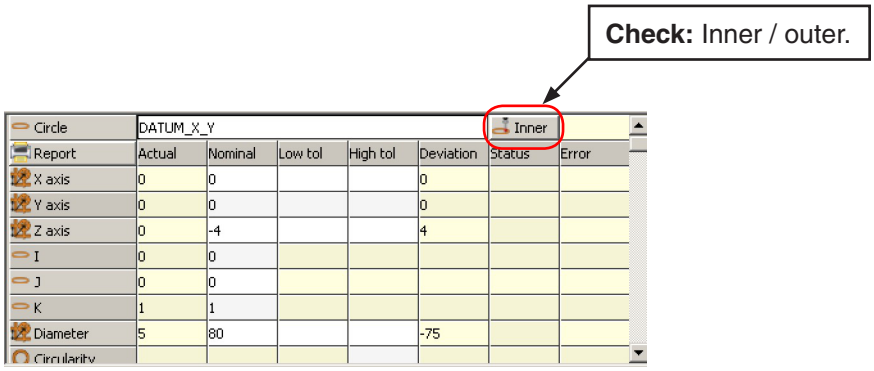
GUIDANCE NOTE: When using head touches it is advisable that the approach is reduced to 2 mm as 10 mm is too large for a head swing.

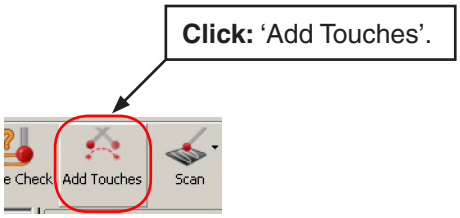


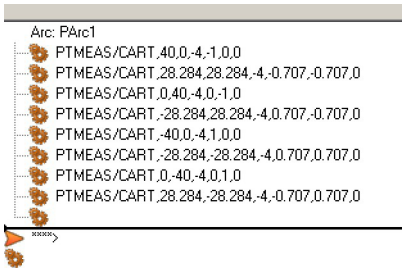




Enter a 'Label' and the circle 'Nominal' data:



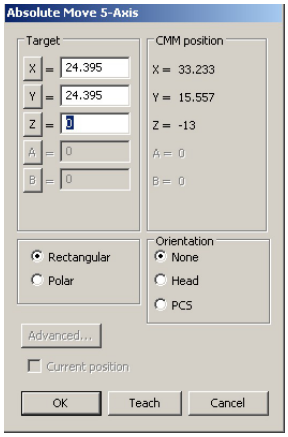




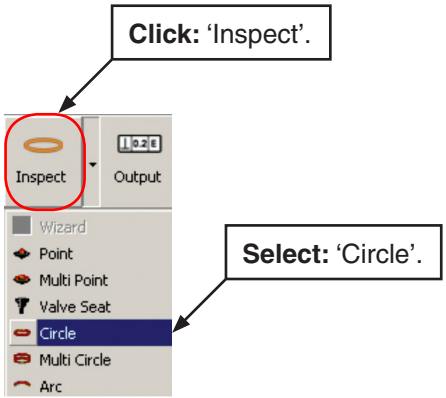
Select: ‘Apply’ to complete the measuring cycle.

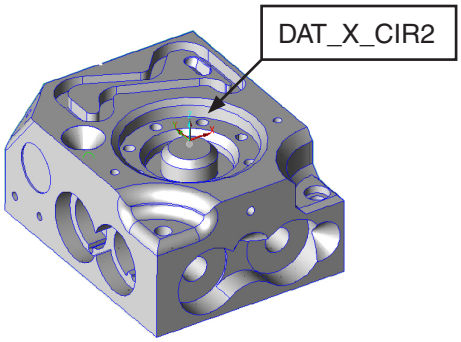
Click ‘Move’ then select ‘Absolute’ or alternatively use the MCU to manually position the probe and then press the ‘Take Point’ button.

Enter the co-ordinates to move the probe to a position above the circle to inspect:

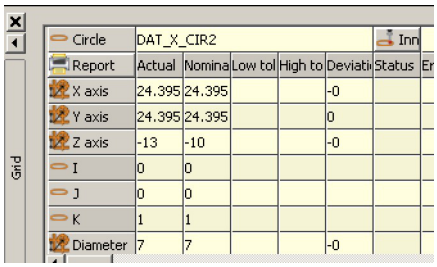


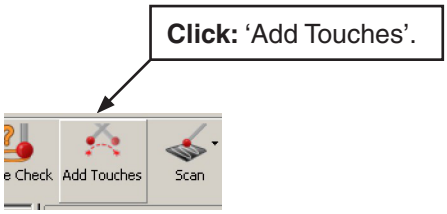
Change ‘Approach’ and ‘Retract’ settings to 1.5 mm.

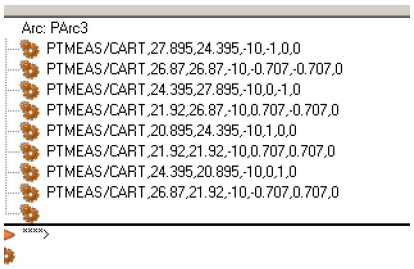




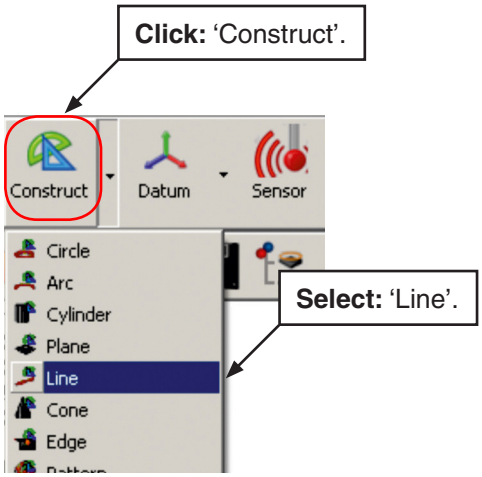
Enter a ‘Label’ and the circle ‘Nominal’ data:

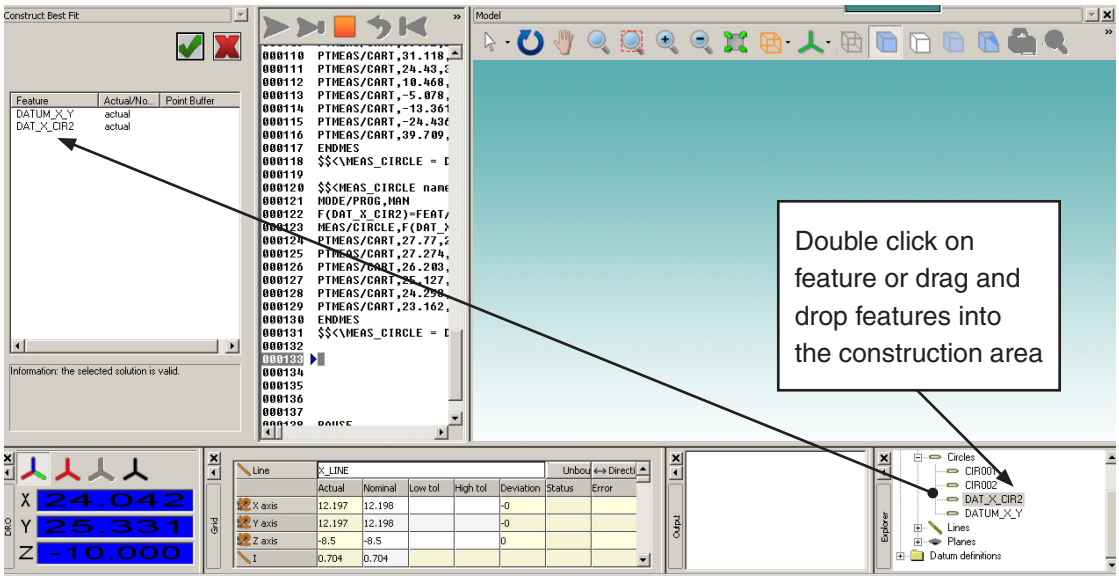






Click: ‘ Apply’ then ‘OK’ to complete the measuring cycle.





Make a note of the order the holes have been inserted in the construction window.

i.e. DATUM_X_Y to DAT_X_CIR2 will give a positive direction
and DAT_X_CIR2 to DATUM_X_Y will give a negative direction

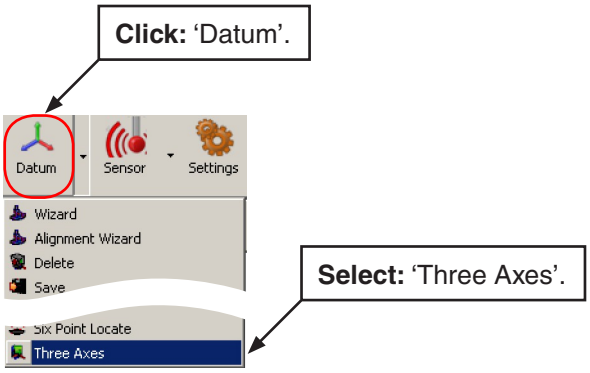
This is important when selecting the axis direction for alignment.

Click: 'APPLY' to complete the construction cycle.

Code produced:

F(X_LINE)=FEAT/LINE,UNBND,CART,12.198,12.198,-8.5,0.704,0.704,-0.087,0.061,0.061,0.996

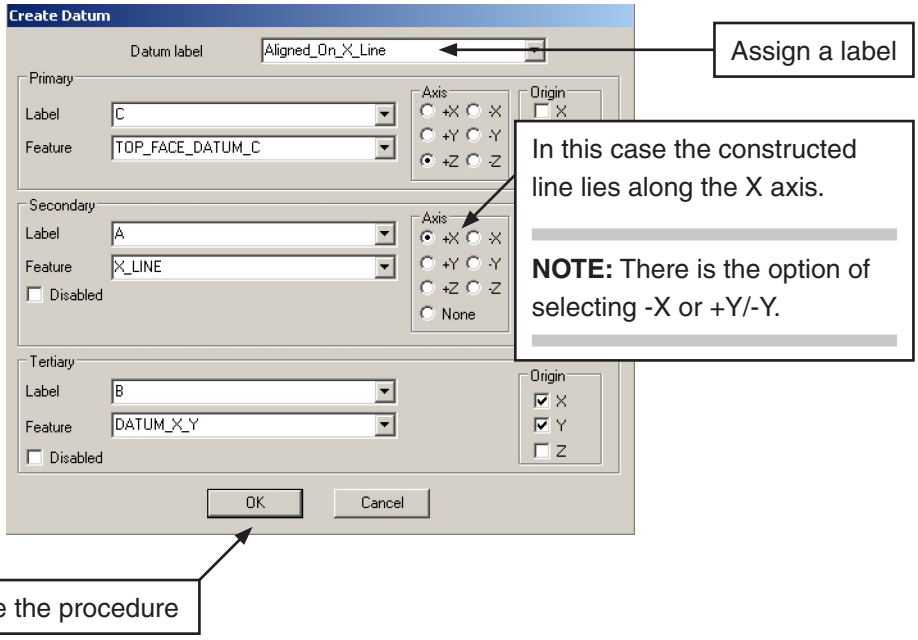
CONST/LINE,F(X_LINE),BF,FA(DATUM_X_Y),FA(DAT_X_CIR2)



In this case
TOP_FACE_DATUM_C
is the PRIMARY AXIS [+Z]
on drawing datum C

X_LINE is the
SECONDARY AXIS [+X]
(no origin here)
on drawing datum A

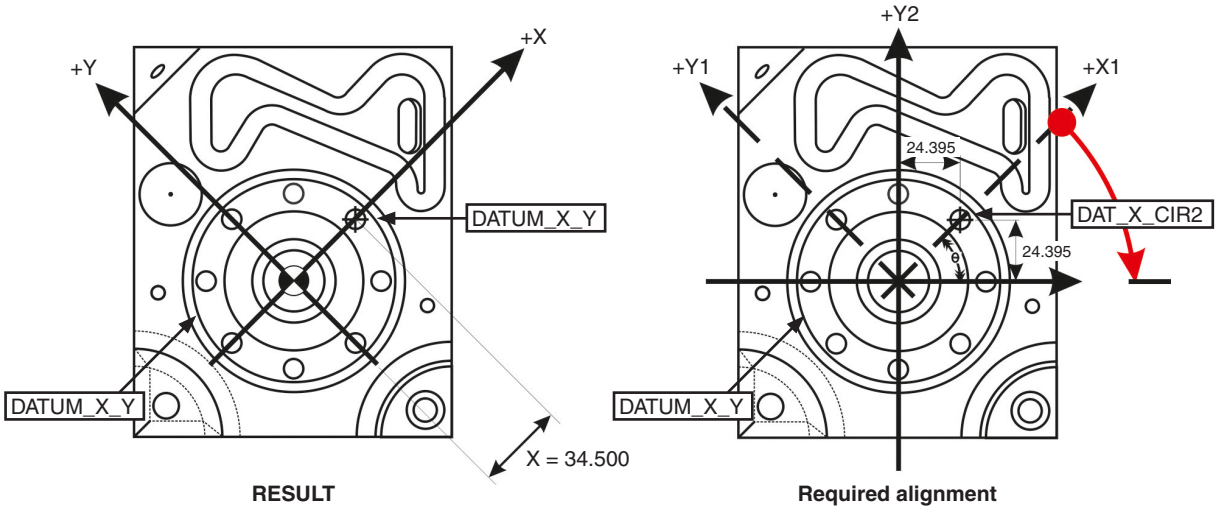
DATUM_X_Y
is the TERTIARY
point origin [X and Y]
on drawing datum B



Now check if both circles are in the correct positions

Left mouse click on DATUM_X_Y. The grid will display the result both X and Y should be at zero.

Left mouse Click on DAT_X_CIR2. The grid will display the result:
X = approx 34.50: Radial distance From DATUM_X_Y
Y = 0.00



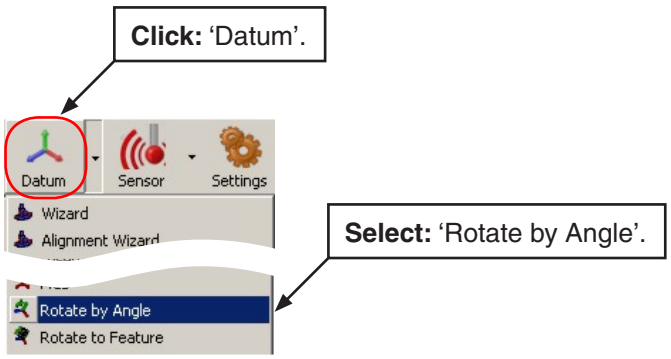
Now make a theoretical rotation using the defined angle through the 2 co-ordinates given ie:-

X = 24.395 and Y = 24.395

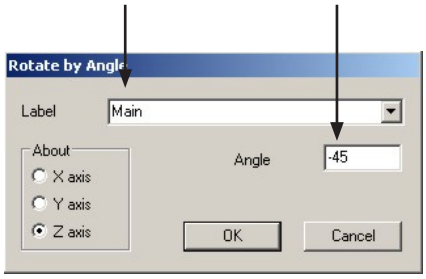
Angle = Inv Tan (24.395 / 24.395) = 45°

In this case to rotate the X and Y axes clockwise by 45°.

NOTE: -ve angles give clockwise rotation, +ve angles give anti-clockwise rotation.



Enter a label for the final alignment and enter the required angle of rotation.



Now check if both circles are in the correct positions.

Left mouse click on DATUM_X_Y. The grid will display the result, both X and Y should still be at zero.

Left mouse click on DAT_X_CIR2. The grid will display the result:
X = 24.394
Y = 24.394

THE PART ALIGNMENT IS NOW COMPLETE AND IT IS READY FOR MEASUREMENT

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H-1000-5319-01